The Impact of COVID-19 Prevalence and its Infection Control Measures on Clinical Practice and the Knowledge of Oral Mucosa Alterations of Some Dental Students of King Khalid University

Mohammed MA Abdullah Al-Abdaly[1]*, Faisal Saeed Mohammed Alhaid[2], Ali Hosain Ali Alqahtani[2] and Rayan Mansour Mezher[2]

[1]*Periodontics and Community Dental Sciences Department, College of Dentistry, King Khalid University, Saudi Arabia*
[2]*College of Dentistry, King Khalid University, Saudi Arabia*

*Corresponding Author: Mohammed MA Abdullah Al-Abdaly, Assistant Professor of Periodontics, Periodontics and Community Dental Sciences Department, College of Dentistry, King Khalid University, Saudi Arabia.

Abstract

Background: Corona-virus disease 2019 (COVID-19) is a pandemic disease arising in Wuhan, China, in December 2019 then spread to most regions in the world and impacted all sides of life. It induced great difficulty in dentistry, so the present study aimed to assess the impact of COVID-19 prevalence and its infection control measures on clinical practice and the knowledge of oral mucosa alterations of some dental students of King Khalid University.

Materials and Methodology: The present study included 350 dental students from the different clinical levels in college of dentistry, King Khalid University. They were divided into three groups. Group I (GI) included 150 participants from levels 7th, 8th and 9th and group II (GII) comprised 150 participants from levels 10th, 11th and 12th, as well as group III (GIII), which included 50 participants from the interns. They were requested to answer the questions of the interview questionnaire to achieve the survey purposes from 25 December 2020 G to 25 February 2021 G. The questionnaire involved different questions about the characteristics of the participants (age, gender and level), their attitude toward COVID-19 infection control measures. Moreover, COVID-19 prevalence among them and the surrounding community and the assessment of their clinical practice and knowledge of oral mucosa alterations. The data tabulated and analyzed using Statistical Package for Social Sciences (SPSS) version 25 and the chi-square test. A p-value of less than 0.05 is considered a statistically significant difference.

Results: The participants' numbers in this study were 350 students from six different levels (7, 8, 9, 10, 11 and 12), as well as the interns in the college of dentistry, King Khalid University. They were divided into three various groups. Group I (GI) included participants from levels 7th, 8th and 9th, group II (GII) included participants from levels 10th, 11th, 12th and group III (GIII) comprised participants from the interns. The large numbers were from GI and GII (67% male and 33% Female). The mean age of the participants in group III more than the mean age of the participants in group I and group II (males and females). There were statistically significant differences in the mean and (± SD) standard deviation of participants' age comparison. There was good Knowledge of infection control measures and the prevalence extent of COVID-19 in the surrounding community of the participants and there were significant

The Impact of COVID-19 Prevalence and its Infection Control Measures on Clinical Practice and the Knowledge of Oral Mucosa Alterations of Some Dental Students of King Khalid University

02

differences in the comparison between the answers of some questions according to the groups of participants. Additionally, that, the answers of participants in the current study exhibited that there was a negative impact of COVID-19 on the participants' clinical practice and the knowledge of oral mucosa alterations.

Conclusion: We concluded that most of the participants in the current study were knowing of COVID-19 symptoms, mode of transmission and infection control measures. Nevertheless, the participants should review the National and international guidelines of COVID-19 infection control.

Keywords: COVID-19; Clinical Practice; Dental Students; Infection Control; Oral Mucosa Alterations

Abbreviations

COVID-19: Corona-virus Disease 2019; SPSS: Statistical Package for Social Sciences; GI: Group One; GII: Group Two; GIII: Group Three; ± SD: Standard Deviation; SARS: Severe Acute Respiratory Syndrome; MERS: Middle East Respiratory Syndrome; CoV: Corona-Virus; WHO: The World Health Organization; CDC: Centers Disease Control; n: Number of Participants

Introduction

Corona-virus (COVID-19) disease is a new viral infection discovered in Wuhan China and, caused the spread of pneumonia quickly in the world more than SARS-CoV and MERS-CoV9 [1]. It is characterized by several essential symptoms such as fever, shortness of breath, dry cough, dyspnea, myalgia and fatigue. These symptoms more severe among elderly patients and patients with chronic systemic diseases [2-4].

COVID-19 is the first pandemic that occurs due to a coronavirus, according to the WHO. Therefore, the World Health Organization (WHO) announced in January 2020 a general emergency and invited cooperation between all countries to avoid its fast prevalence and the WHO considered it a worldwide pandemic infection [5,6]. Consequently, there was global cooperation to avoid the more fast prevalence of the virus where quarantine, closing borders, social distancing, self-isolation and in some cases, a complete close of cities applied worldwide that caused an international economic crisis and humans' psychology problems in different levels [7].

Saudi Arabia government quickly applied these specific prevention strategies to restrain the spread of this virus after confirmation of the first case on March 2nd 2020 G such, as suspension of all airline flight inbound and outbound, close malls and shops, except grocery stores and pharmacies. Furthermore, close of schools and universities, suspension of Umrah visas and prayers at Holy Mosques in Mekkah and Almadina and other mosques and imposed a countrywide curfew on 24 of March 2020 G to restrict the activity of the population most of the day hours [8]. The people movement restriction outside their home, the stopping of most of working activities, socialite distancing and ask the people to use masks and gloves all helping in reducing the probability of contact between not infected people and infected [9].

It is worth noting, the humans infected in Wuhan, China, due to contact with the animals in the Huanan Seafood market [10]. The routes of human-to-human transmission of COVID-19 are by airborne droplets, touch contaminated surface or communicate with an infected person and there is no evidence of blood or saliva transmission of COVID-19 as HIV/AIDS, HCV and HBV [11].

The oral mucosa may appear features of viral infections such as blistering, ulceration, glossitis, halitosis, gingival bleeding and pain. Thus, it was suggested to perform intraoral examinations in patients suspected of COVID-19 due to the association between systemic diseases and oral mucosa health status, it is also possible that the oral manifestations may be due to other viruses or bacteria [12-16].

The Impact of COVID-19 Prevalence and its Infection Control Measures on Clinical Practice and the Knowledge of Oral Mucosa Alterations of Some Dental Students of King Khalid University

03

There was an impact of COVID-19 prevalence in Saudi Arabia on oral diseases diagnosis due to the suspension of clinical teaching activities in dental schools and public and private dental clinics. Moreover, the long period of disease incubation and the big menace of the COVID-19 patients who do not show symptoms [17], so we designed this study to assess the impact of COVID-19 prevalence and its infection control measures on clinical practice and the knowledge of oral mucosa alterations of some dental students of King Khalid University.

As far as we know, this study is the first study in the college of dentistry, King Khalid University, to assess these objectives among dental students, moreover, the results of this study may help policymakers to evaluate infection controls measures and the impact of COVID-19 on the knowledge of oral mucosa alterations among of dental students and also help public health officials to take more public health procedures and improvements of policy to prevent the spread of COVID-19.

Materials and Methods

Sample size and design of the study

Despite we depended on 300 participants as a minimum sample size but, this cross-sectional survey study conducted on sample size included 350 participants. It was done from 25 December 2020 G to 25 February 2021 G among dental students from six different levels (7, 8, 9, 10, 11 and 12), as well as the interns in the college of dentistry, King Khalid University. They were divided into three various groups. Group I (GI) included participants from levels 7th, 8th and 9th, group II (GII) included participants from levels 10th, 11th, 12th and group III (GIII) comprised participants from the interns, aged between 22 and 25 years old.

The design of the study questionnaire and its self-report were prepared according to the pre-tested design and published and according to the centers for Disease Control and Prevention (CDC) guidelines for the community of COVID-19 [18,19]. The questionnaire of this study designed in English and didn't take more than 5 min to fill. The questionnaire contained five parts: the characteristics of participants in the study, their knowledge and behavior toward COVID-19, infection control measures during the clinical practice, prevalence and extent of COVID-19 in the surrounding community and the dental clinics and its impact on the clinical work and the knowledge of oral mucosa alterations of the participants. The answers to the questions were evaluated as (correct) or (incorrect) and (Yes) or (No). All answers were arranged into six separate tables.

Ethical approval

The ethical clearance certificate of the current study was obtain (IRB/KKUCOD/2020-21/052). The research was conducted according to instructions and guidelines of the institutional review board (IRB), college of dentistry, King Khalid University, Saudi Arabia and the consent of participants taken before beginning the study.

Exclusion criteria

- The students in the pre-clinical levels.

- The students who refused to participate in the study.

Statistical analysis

ANOVA test was used to assess differences in mean values for the participants' ages. The statistically significant differences between the participants' answers were estimated using the Chi-Square test. A P-value of less than 0.05 was considered statistically significant differences ($p < 0.05$) and less than 0.001 high statistically significant differences ($p < 0.001$).

The Impact of COVID-19 Prevalence and its Infection Control Measures on Clinical Practice and the Knowledge of Oral Mucosa Alterations of Some Dental Students of King Khalid University

04

Results

The main characteristics of the participants in the current study shown in table 1 and 2 and figure 1 and 2. A total of 350 students answered the questions of this study questionnaire. There was an increase in male participants (66%) more than female participants (34%). Table 1 and 2 and figure 1 and 2 displayed that there were 100 participants (67%) of males and 50 participants (33%) of females from group I and there were 100 participants (67%) of males and 50 participants (33%) of females from group II whereas there were 30 male (60%) and 20 (40%) female from group III.

Groups		Number of participants (NO)			Chi Square
Male (n = 230) No (%)		Female (n = 120)	Total (n = 350)	Pearson Chi-square (P-	
		No (%)	No (%)	value)	
Group I (GI)		100 (67%)	50 (33%)	150 (43%)	
Group II (GIII)		100 (67%)	50 (33%)	150 (43%)	8.266 (0.001*)
Group III (GIII)		30 (60%)	20 (40%)	50 (14%)	
Total		230 (66%)	120 (34%)	350 (100%)	
Chi Square	Pearson Chi-Square (P-value)	41.282 (0.157)			

Table 1: *Distribution of participants according to the groups and the gender.*
*GI: Group I; GII: Group II; GIII: Group III; n: Number of patients; *: p < 0.05.*
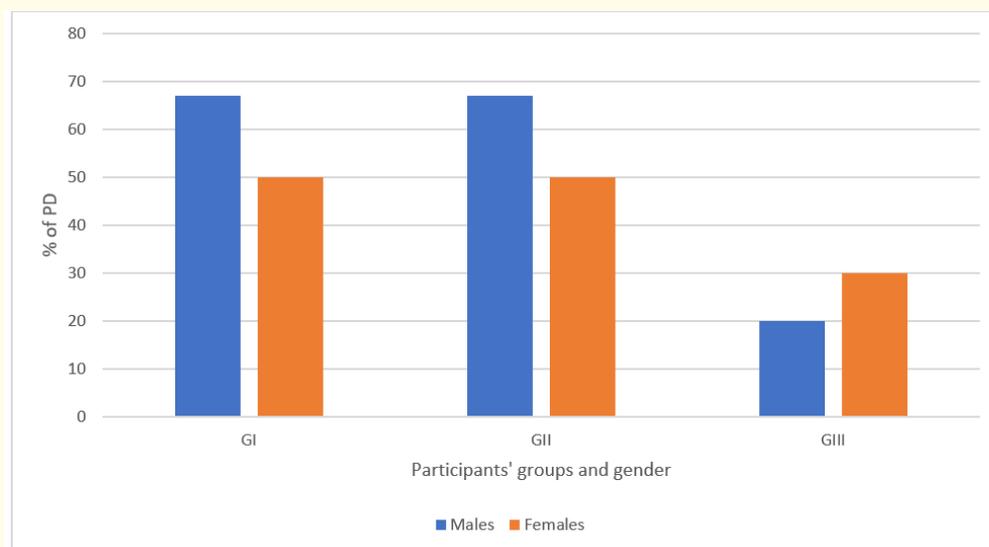
Figure 1: *Distribution of participants according to groups and gender.*
GI: Group I; GII: Group II; GIII: Group III; %PD: Percentage of Patients Distribution.

The Impact of COVID-19 Prevalence and its Infection Control Measures on Clinical Practice and the Knowledge of Oral Mucosa Alterations of Some Dental Students of King Khalid University

05

Groups	Mean and ± SD of Age		ANOVA
Male **Mean (± SD)**	**Female**		
	Mean (± SD)	**F (P-value)**	
Group I (GI)	22.33 (17.628)	22.06 (4.786)	
Group II (GIII)	23.12 (9.573)	23.00 (0.01)	11.256 (0.335)
Group III (GIII)	24.94 (9.916)	24.36 (10.96)	
ANOVA F (P- value)	13.495 (0.077)		

Table 2: *The patients age groups according to the gender.*

GI: Group I; GII: Group II; GIII: Group III; SD: Standard deviation.
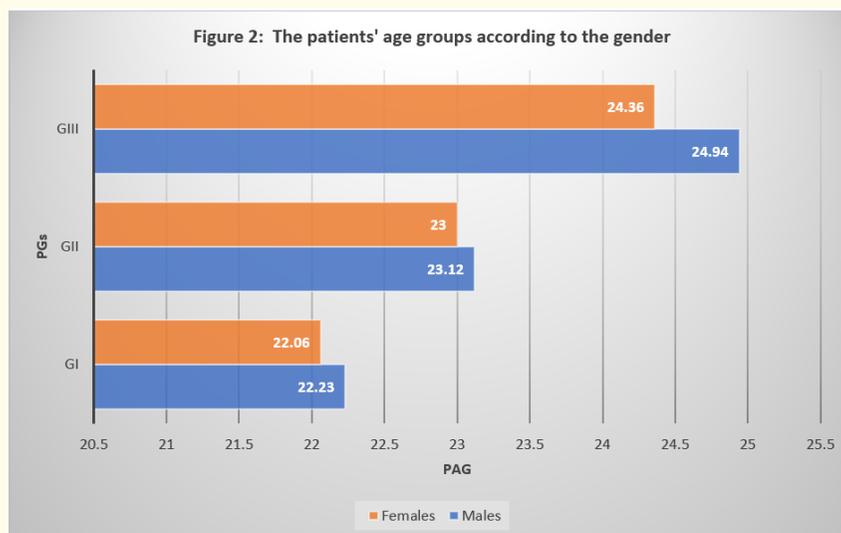
Figure 2: *The patients' age groups according to the gender.*

GI: Group I; GII: Group II; GIII: Group III; PGs: Patients' Age Groups; PAG: Patients' Age.

The mean and standard deviation (± SD) of the males and females participants' ages in group I, group II and group III were (22.33 ± 17.628), (23.12 ± 9.573) and (24.94 ± 9.916) years respectively and (22.06 ± 4.786), (23.00 ± 0.01) and (24.36 ± 10.96) years respectively. There were highly statistically significant in the distribution of participants according to gender ($p = 0.001$), whereas there were no statistically significant in the distribution of participants according to the levels and the age ($p > 0.05$).

Regarding the participants' knowledge and behavior toward COVID-19, most of the participants in group I, group II and group III (85%, 87% and 94%) know the microorganism that causes COVID-19, age groups affected by COVID-19 (81%, 87% and 86%), the method of COVID-19 spread (81%, 87% and 96%), the symptoms of COVID-19 infection (77%, 79% and 88%) and the most of them knew the most severe complication of COVID-19 (74%, 77% and 90%). There were statistically differences in the answers to these questions ($p < 0.05$)

The Impact of COVID-19 Prevalence and its Infection Control Measures on Clinical Practice and the Knowledge of Oral Mucosa Alterations of Some Dental Students of King Khalid University

06

except the answers of the questions about the age groups that were most affected by COVID-19, where there were no statistical significance differences (p > 0.05).

Moreover, 73% of group I participants, 72% of group II participants and 64% of group III participants reported that there was an effect of the COVID-19 pandemic on their daily activity with statistically significant differences in the answers of this question according to groups of participants (p < 0.05). On the other hand, 84% of group I participants, 85% of group II participants and 80% of group III participants reported that they follow the developing news about Covid-19, but without the significant relationship between the levels of students and the answers to this question (p = 0.095).

Concerning the information about the corona-virus and the methods of protection from it, 83% of group I participants, 82% of group II participants and 78% of group III participants reported that this information and methods of protection are enough. In a comparison of 98% of group I participants, 97% of group II participants and 96% of group III participants said the measures taken by the government to stop the spread of COVID-19 are enough. The majority of group I participants, group II participants and group III participants (98%, 99% and 96%) respectively exhibited that the measures taken by the university to stop the spread of COVID-19 are enough. Consequently, table 3 displayed that there were no differences in knowledge and behavior toward COVID-19 among the participants (Table 3).

No of Q	Questions	Answers	No and percentage of Participants (n = 350)			Chi-Square
			GI (n = 150)	GII (n = 150)	GIII (n = 150)	Pearson Chi (P value)
			No (%)	No (%)	No (%)	
1	What is the microorganism that causes Covid-19?	Correct	128 (85%)	130 (87%)	47 (94%)	9.331 (0.037*)
		Incorrect	22 (15%)	20 (13%)	3 (6%)	
2	Did Covid-19 pandemic effect on your daily activity?	Yes	110 (73%)	108 (72%)	32 (64%)	11.442 (0.095)
		No	40 (27%)	42 (28%)	18 (36%)	
3	What are the age groups most affected by Covid-19?	Correct	122 (81%)	131 (87%)	43 (86%)	6.554 (0.062)
		Incorrect	28 (19%)	19 (13%)	7 (14%)	
4	How does Corona virus spread?	Correct	121 (81%)	131 (87%)	48 (96%)	4.521 (0.053*)
		Incorrect	29 (19%)	19 (13%)	2 (4%)	
5	What are the symptoms of Covid-19 infection?	Correct	116 (77%)	118 (79%)	44 (88%)	8.142 (0.047*)
		Incorrect	34 (23%)	32 (21%)	6 (12%)	
6	What is the most severe complication of Covid-19 infection?	Correct	111 (74%)	115 (77%)	45 (90%)	8.142 (0.015*)
		Incorrect	39 (26%)	35 (23%)	5 (10%)	
7	Do you follow the developing news about Covid-19?	Yes	126 (84%)	127 (85%)	40 (80%)	14.012 (0.050*)
		No	24 (16%)	23 (15%)	10 (20%)	
8	Are there enough information about the Corona virus and methods of protection from it?	Yes	125 (83%)	123 (82%)	39 (78%)	10.324 (0.049*)
		No	25 (17%)	27 (18%)	11 (22%)	
9	Are the measures taken by the government enough to stop the spread of Covid-19?	Yes	147 (98%)	146 (97%)	48 (96%)	13.221 (0.856)
		No	3 (2%)	4 (3%)	2 (4%)	
10	Are the measures taken by the university enough to stop the spread of Covid-19?	Yes	147 (98%)	149 (99%)	48 (96%)	11.663 (0.443)
		No	3 (2%)	1 (1%)	2 (4%)	

Table 3: *The participants' knowledge and behavior toward COVID-19.*
*GI: Group I; GII: Group II; GIII: Group III; n: Number of Patients; *: p < 0.05.*

The Impact of COVID-19 Prevalence and its Infection Control Measures on Clinical Practice and the Knowledge of Oral Mucosa Alterations of Some Dental Students of King Khalid University

07

The assessment of COVID-19 prevalence and extent in the surrounding community and during the clinical practice was recorded in table 4. All participants (100%) clarified that there are cases of COVID-19 in their regions, whereas 65% of group I participants, 63% of group II participants and 68% of group III participants indicated that there are cases in their cities and villages and 62% of group I participants, 55% of group II participants and 68% of group III participants reported that there are cases among their neighborhoods. Moreover, 53% of group I participants and 52% of group II participant and 56% of group III participants said that there are cases detected within their families. All participants (100%) exhibited positive answers when we asked them if these infected patients with COVID-19 recovered or no.

No of Q	Questions	Answers	No and percentage of participants (n = 350)			Chi-Square
			GI (n = 150)	GII (n = 150)	GIII (n = 50)	Pearson Chi (P value)
			No (%)	No (%)	No (%)	
1	Are there any Covid-19 cases in your region?	Yes	150 (100%)	150 (100%)	50 (100%)	17.763 (0.792)
		No	00 (00%)	00 (00%)	00 (0%)	
2	Are there any Covid-19 cases in your city/ village?	Yes	97 (65%)	94 (63%)	34 (68%)	8.332 (0.092)
		No	53 (35%)	56 (37%)	16 (32%)	
3	Are there any Covid-19 cases in your neigh-borhood?	Yes	93 (62%)	83 (55%)	34 (68%)	9.599 (0.05*)
		No	57 (38%)	67 (45%)	16 (32%)	
4	Is there any Covid-19 cases in your family?	Yes	80 (53%)	78 (52%)	28 (56%)	6.479 (0.091)
		No	70 (47%)	72 (48%)	22 (44%)	
5	If yes, Did he/she recover?	Yes	80 (100%)	78 (100%)	28 (100%)	17.763 (0.792)
		No	00 (00%)	00 (0%)	00 (00%)	
6	Was any of your patients infected by Corona virus?	Yes	55 (37%)	64 (45%)	18 (36%)	13.835 (0.048*)
		No	95 (63%)	86 (55%)	32 (64%)	
7	If yes, Did he recovered?	Yes	55 (100%)	64 (100%)	18 (100%)	17.763 (0.792)
		No	0 (00%)	0 (00%)	0 (00%)	
8	Was any of your colleague infected by corona virus?	Yes	92 (61%)	76 (51%)	31 (62%)	7.096 (0.05*)
		No	58 (39%)	74 (49%)	19 (38%)	
9	If yes, Did he recovered?	Yes	92 (100%)	76 (100%)	31 (100%)	17.763 (0.792)
		No	00 (00%)	00 (00%)	00 (00%)	
10	Did you contact or socialize with Covid-19 patients?	Yes	62 (41%)	62 (41%)	17 (34%)	9.284 (0.039*)
		No	88 (59%)	88 (59%)	33 (66%)	
11	If yes, were you infected?	Yes	4 (8%)	6 (10%)	2 (12%)	10.541 (0.092)
		No	50 (92%)	56 (90%)	15 (88%)	
12	If you were infected, How long it took you to be recovered?	Correct	62 (41%)	62 (41%)	17 (34%)	12.762 (0.05*)
		Incorrect	88 (59%)	88 (59%)	33 (66%)	
13	Do you know anyone was infected and had no symptoms?	Yes	83 (55%)	77 (51%)	26 (52%)	9.536 (0.077)
		No	67 (45%)	73 (49%)	24 (48%)	
14	Did you experience Covid-19 symptoms?	Yes	60 (40%)	72 (48%)	31 (62%)	8.941 (0.005*)
		No	90 (60%)	78 (52%)	19 (38%)	
15	Were you tested for Corona virus?	Yes	86 (57%)	78 (52%)	28 (56%)	11.421 (0.05*)
		No	64 (43%)	72 (48%)	22 (44%)	
16	If yes, was it negative or positive?	Negative	68 (79%)	68 (87%)	18 (64%)	7.843 0.005*
		Positive	18 (21%)	10 (13%)	10 (36%)	

***Table 4:** Prevalence extent of COVID-19 in the surrounding community and during the clinical practice.*

*GI: Group I; GII: Group II; GIII: Group III; n: Number of patients; *: p < 0.05.*

The Impact of COVID-19 Prevalence and its Infection Control Measures on Clinical Practice and the Knowledge of Oral Mucosa Alterations of Some Dental Students of King Khalid University

08

When we also asked the participants if there was an infected patient with COVID-19 among their patients or their colleagues. The answers to these questions clarified that nearly two third of participants' patients (37% of group I participants' patients, 45% of group II participants' patients and 36% group III participants' patients) infected with COVID-19 and all of these patients recovered. Regarding the contact or socialization with COVID-19 patients, 41% of group I participants, 41% of group II participants and 34% of group III participants reported that they socialized with COVID-19 patients and the answers clarified that 8% of group I participants, 10% of group II participants and 12% of group III participants were infected and all of them took 14 days for recovery. Nearly half of the participants said to know some patients were infected with COVID-19 and had no symptoms. Moreover, 40% of group I participants, 48% of group II participants and 62% of group III participants reported that some of these patients experienced COVID-19 symptoms. An approximate percentage of participants (57% of group I participants, 52% of group II participants and 56% of group III participants) reported that they tested for COVID-19 and 79% of group I participants, 87% of group II participants and 64% of group III participants said the results of the test were negative. Consequently, A high percentage of group III participants indicated that there was a spread of COVID-19 in their surrounding community more than the participants in group I and group II with statistically significant differences in 50% of answers the questions of the prevalence extent of COVID-19 in the surrounding community and during the clinical practice (p < 0.05).

Regarding Infection control measures during the participants' clinical practice, almost all of the students (350) were interested in developing personal protection at the clinic. Furthermore, 93% of group I, 95% of group II and 88% of group III clarified that their patients received the correct ways for self-protection against COVID-19.

On the other hand, high percentages of participants (84% of group I, 91% group II and 88% of group III) reported that the personal protection methods were enough and 81% of group I, 83% of group II and 78% of group III said, when they find one of their patients infected with COVID-19, they called to COVID-19 hotline for instructions and recognizing when and where to take the COVID-19 test, then they stayed at home for 14 days away from others. When we asked the participants if they are going to be worried if a vaccine will be available, 85% of group I, 89% of group II and 78% of group III exhibited that they will be worry to take the vaccine, but 85% of group I, 81% of group II and 98% of group III reported that when the vaccine be available, they will take it (Table 5).

Table 5 revealed also that 85% of group I, 82% of group II and 82% of group III answered in the negative when asked about COVID-19 drug when it is available if they will be worried or will be hesitant to take it in case needed. Regarding taking precautions with every patient to control COVID-19 spread protection, 77% of group I, 74% of group II and 74% of group III reported that they took body temperature. Consequently, 86% of group I, 90% of group II and 90% of group III answers were positive. Further, 75% of group I, 90% of group II and 86% of group III said that they apply the isolation with a rubber dam during the clinical practice and 68% of group I, 76% of group II and 76% of group III said that the high-volume suction was available during the clinical practice. In contrast, 57% of group I, 52% of group II and 42% of group III reported that they did not require their patients to wash the mouth with antimicrobial mouthwash during the clinical practice. According to the participants' answers in table 5, the Infection control measures during the clinical practice were better among the participants of group II than group I and group III. When the Chi-Square test was used, there were statistically significant differences in some answers to infection control measures questions (p< 0.05). Moreover, there was no significant difference detected in other questions' answers (p > 0.05).

No of Q	Questions	Answers	No and percentage of Participants (n = 350)			Chi-Square
			GI (n = 150)	GII (n = 150)	GIII (n = 50)	Pearson Chi
			No (%)	No (%)	No (%)	(P value)
1	Are you interested in developing the personal protection at the clinic?	Yes	150 (100%)	150 (100%)	50 (100%)	17.763 (0.792)
		No	00 (0%)	00 (0%)	00 (0%)	
2	What are the ways of protection you advise your patients?	Correct	140 (93%)	142 (95%)	44 (88%)	7.061 (0.055*)
		Incorrect	10 (7%)	8 (5%)	6 (12%)	
3	Do you take enough personal protection at the clinic?	Yes	126 (84%)	136 (91%)	44 (88%)	9.177 (0.049*)
		No	24 (16%)	14 (9%)	6 (12%)	

The Impact of COVID-19 Prevalence and its Infection Control Measures on Clinical Practice and the Knowledge of Oral Mucosa Alterations of Some Dental Students of King Khalid University

09

4	How would you manage if you find out one of your patients was infected by corona virus?	Correct	122 (81%)	124 (83%)	39 (78%)	4.394 (0.035*)
		Incorrect	28 (19%)	26 (17%)	11 (22%)	
5	Are you going to be worried if a vaccine will be available?	Yes	127 (85%)	133 (89%)	39 (78%)	9.282 (0.025*)
		No	23 (15%)	17 (11%)	11 (22%)	
6	If a vaccine is available for corona virus, Will you take it?	Yes	129 (85%)	122 (81%)	49 (98%)	12.172 (0.005*)
		No	21 (15%)	28 (19%)	1 (2%)	
7	If a treatment is available, would you be worried or hesitated to take it in case you needed it?	Yes	22 (15%)	27 (18%)	9 (18%)	7.061 (0.177)
		No	128 (85%)	123 (82%)	41 (82%)	
8	Do you take body temperature of patient before clinical practice?	Yes	115 (77%)	111 (74%)	37 (74%)	9.884 (0.945)
		No	35 (23%)	39 (26%)	13 (26%)	
9	Do You take precautions to control COVID-19 spread with every patient?	Yes	129 (86%)	135 (90%)	45 (90%)	11.115 (0.656)
		No	21 (14%)	15 (10%)	5 (10%)	
10	Do you apply isolation with a rubber dam during clinical practice?	Yes	113 (75%)	135 (90%)	43 (86%)	6.337 (0.05*)
		No	37 (25%)	15 (10%)	7 (4%)	
11	Is the high-volume suction available during Your clinical Practice?	Yes	102 (68%)	114 (76%)	38 (76%)	12.364 (0.058)
		No	48 (32%)	36 (24%)	12 (24%)	
12	Do You require your patients to wash the mouth with Antimicrobial mouthwash during clinical practice?	Yes	64 (43%)	72 (48%)	29 (58%)	14.241 (0.048*)
		No	86 (57%)	78 (52%)	21 (42%)	

Table 5: *Infection control measures during the participants' clinical practice.*
*GI: Group I; GII: Group II; GIII: Group III; n: Number of Patients. *: p < 0.05.*

On the subject of the impact of COVID-19 on the participants' clinical practice and oral mucosa alterations diagnosis knowledge (Table 6). A high percentage of participants (67% of group I, 73% of group II and 80% of group III) clarified that their patients currently less than the patients before 15 March 2020. All of the participants (100%) revealed that their clinical practice now is not for emergency cases due to COVID-19, but 60% of group I and 80% of group II and 80% of group III indicated that their patients were not cooperative with clinical practice closure and reduction and a high percentage of participants (72% of group I, 83% of group II and 70% of group III) revealed that the patients were not apologize to attend to the clinics of treatment after 15 March 2020.

No of Q	Questions	As	No and percentage of Participants			Chi-Square
			GI (n = 150)	GII (n = 150)	GIII (n = 50)	Pearson Chi
			No (%)	No (%)	No (%)	(P value)
1	Is the number of your patients currently less than the number of patients before 15 March 2020?	Yes	100 (67%)	110 (73%)	40 (80%)	0.540 (0.013*)
		No	50 (33%)	40 (27%)	10 (20%)	
2	Is your clinical practice currently for emergency cases only due to COVID-19?	Yes	00 (0%)	00 (0%)	00 (0%)	17.650 (0.273)
		No	150 (100%)	150 (100%)	50 (100%)	
3	Are your patients aware and cooperative with clinical practice closure and reduction?	Yes	60 (40%)	30 (20%)	10 (20%)	0.211 (0.05*)
		No	90 (60%)	120 (80%)	40 (80%)	
4	Did your patients apologize to attend after 15 March 2020?	Yes	43 (28%)	25 (17%)	15 (30%)	2.427 (0.048*)
		No	107 (72%)	125 (83%)	35 (70%)	

The Impact of COVID-19 Prevalence and its Infection Control Measures on Clinical Practice and the Knowledge of Oral Mucosa Alterations of Some Dental Students of King Khalid University

10

			GI	GII	GIII	
5	Do you feel fear or anxiety during the clinical practice due to COVID-19?	Yes	150 (100%)	150 (100%)	50 (100%)	17.650 (0.273)
		No	00 (0%)	00 (0%)	00 (0%)	
6	Do you fear of quarantined if get COVID-19?	Yes	139 (93%)	147 (98%)	48 (96%)	13.330 (0.081)
		No	11 (7%)	3 (2%)	2 (4%)	
7	Do you know if there are oral symptoms/signs of Covid-19?	Yes	63 (42%)	68 (45%)	17 (34%)	13.188 (0.05*)
		No	87 (58%)	82 (55%)	33 (66%)	
8	Did you detect any ulcerations, blisters, petechiae and reddish macules in the oral mucosa during the clinical practice after 15 March 2020?	Yes	44 (29%)	50 (33%)	17 (34%)	8.644 (0.041*)
		No	106 (71%)	100 (67%)	33 (66%)	
9	Did some of your patients complain of gingival bleeding, low taste, recurrent ulceration, or xerostomia during your clinical practice after 15 March 2020?	Yes	32 (21%)	35 (23%)	20 (40%)	0.851 (0.057*)
		No	118 (79%)	115 (77%)	30 (60%)	
10	Do you think that dental clinics can be a possible area of COVID-19 spread?	Yes	150 (100%)	150 (100%)	50 (100%)	17.763 (0.792)
		No	00 (0%)	00 (0%)	00 (0%)	
11	Do you afraid that you could transfer COVID-19 from dental clinics to your family?	Yes	150 (100%)	150 (100%)	50 (100%)	17.763 (0.792)
		No	00 (0%)	00 (0%)	00 (0%)	
12	Do you postpone your dental practice of patients with symptoms of COVID-19?	Yes	150 (100%)	150 (100%)	50 (100%)	17.763 (0.792)
		No	00 (0%)	00 (0%)	00 (0%)	
13	Do You know what you should do if you detect COVID-19 systemic and oral manifestation with your patient during clinical practice?	Yes	150 (100%)	150 (100%)	50 (100%)	17.763 (0.792)
		No	00 (0%)	00 (0%)	00 (0%)	

Table 6: *Impact of COVID-19 on the participants' clinical practice and oral mucosa alterations knowledge.*
*GI: Group I; GII: Group II; GIII: Group III; n: Number of patients; *: p < 0.05.*

Regarding the impact of COVID-19 on the feel of fear or anxiety during clinical practice, all participants answered in the affirmative (100%), the majority (93% of group I, 98% of group II and 96% of group III reported they are feeling fear from quarantine if they get COVID-19. Moreover, all participants (100%) were afraid to transfer COVID-19 from dental clinics to their families and they clarified that the dental clinics could be a possible area of COVID-19 spread. When we asked the participants if there are oral symptoms/signs of COVID-19. Some of the participants answered that there were oral symptoms/signs of COVID-19 (42% of group I, 45% of group II and 34% of group III). However, the high percentage of participants (48% of group I, 55% of group II and 66% of group III) answered in the negative.

Finally, the participants asked if they detected any ulcerations or any abnormal alterations in the oral mucosa or if there were any patients' complaints during the clinical practice after 15 March 2020. Few of the participants reported that there were ulcerations in the oral mucosa of COVID-19 patients and these patients were complaining of dry mouth and reduction of taste. As a result, they preferred to postpone the dental treatment and contact the COVID-19 hotline. There were implications of COVID-19 on clinical practice and oral mucosa alterations diagnosis knowledge among group III participants more than group I participants and group II participants. There were statistically significant differences in some answers to questions (p < 0.05). Moreover, there was no significant difference detected in other questions' answers (p > 0.05).

The Impact of COVID-19 Prevalence and its Infection Control Measures on Clinical Practice and the Knowledge of Oral Mucosa Alterations of Some Dental Students of King Khalid University

11

Discussion

COVID-19 is a recent epidemic disease that caused a big menace to public health and scared worldwide and it is still a daily search subject in the media and among dentists, especially during clinical practice. It should be noted that, during the COVID-19 pandemic spread, concern, fright and tension levels rise among the dentists is more compared with other medical care staff and the general population because they are in close contact with the patients during clinical practice. Consequently, they are more at risk for infection. Several studies assessed the level of awareness, behavior and practices towards some infectious diseases, but there were no studies done in the college of dentistry, King Khalid University on the effect of COVID-19 on dental clinical practice and the knowledge of oral mucosa abnormal changes of COVID-19 patients [18,20].

Therefore, this study was designed to assess these objectives among dental students of King Khalid University. Moreover, the results of this study may be helpful when planning oral health education programs during COVID-19 prevalence. The collected information in this study may be a help also to monitor the dental students' behavior to avoid the spread of COVID-19 in the dental schools of Saudi Arabia during the clinical practice and help to remove the fear about the disease. Additionally, the results of this study may be a help to publish accurate data about the role that the dental clinics can play in reducing COVID-19 spread. Consequently, the questionnaire of this study was dependent on the educational instructions provided by the Ministry of Health (MOH) in Saudi Arabia to achieve these objectives.

The means of age groups in the current study were 22.3, 23.12 and 24.94 years, less than the means age groups in the other previous studies (47to 62 years), that due to the inclusion criteria of the current study, where all the participants of this study were students in the last levels of the undergraduate study [21-23]. Most participants in this study were males (66%) more than females (34%), consistent with the results of a study conducted in Italy that revealed that most participants were males (60.4%) [24].

This study clarified good information about the awareness of participants the COVID-19 caused factor, the age groups most affected, its routes of spread, its methods protection, its symptoms and the most its severe complication, that is due to continuous information of COVID-19 within the media, their follow the developing news about COVID-19, preventive measures of the Saudi government and the actions that were taken by the university. This might explains the statistically significant difference between the answers to some questions in the present study (the participants' awareness and behavior toward COVID-19). Moreover, the majority of participants in the current study reported that there were COVID-19 effects on their daily clinical work, that agree these findings of the previous study revealed a large number of participated dentists closed their clinics until the numbers of COVID-19 cases decrease [1].

On the other hand, most of the participants in a previous study (81.5%) reported they knew persons affected by COVID-19 [25]. These findings are consistent with the results of the current study, where the participants revealed that there were COVID-19 cases among their surrounding community (Regions, cities/villages, neighborhoods, families, patients and colleagues) and all these cases recovered. Furthermore, few percentages of participants exhibited that they were infected and recovered due to some of their patients had no symptoms and there was inconsistency in their answers about identifying the correct duration of recovery. As we all know, asymptomatic COVID-19 patients are risk factors of disease transmission [26]. Nearly half of the participants in the current study revealed that they have experience COVID-19 symptoms after contact with asymptomatic COVID-19 patients and reported that they went for doing COVID-19 test, where the COVID-19 test was positive among few percentages of participants (21% of group I, 13% of group II and 36% of group III).

According to the results of Guan., *et al*. study, there was more number of dentists aware of the guidelines of WHO infection control in the dental clinics, including recording body temperature of the patients [21]. That is corresponding with the findings of the current study where all participants revealed that they interested in developing the personal protection at the clinic and take enough preservation at the clinic. Moreover, most participants clarified that they illustrated to their patients the correct ways of protection.

The Impact of COVID-19 Prevalence and its Infection Control Measures on Clinical Practice and the Knowledge of Oral Mucosa Alterations of Some Dental Students of King Khalid University

12

The guidelines on the COVID-19 pandemic revealed postponement of non-necessary dental treatment [1,27]. These recommendations agree with the answers of most of the participants in the current study. When we asked the participants if they requested the patients to wash the mouth with antimicrobial mouthwash during clinical practice to reduce the microbial effect. Nearly half of the participants answered positively due to the impact of antimicrobial mouthwash to reduce the viral proliferation and anti-viral activity of some agents in mouthwash [28,29].

There was an agreement among most dentists in another study that precautions to taken during the clinical practice for every patient, but these participants reported not using the rubber dam for every patient. While the most of participants in the current study exhibited that, they take precautions to control COVID-19 spread and apply isolation with a rubber dam during clinical practice with every patient [27]. Moreover, the participants in the current study revealed that the high-volume suction was available during their clinical practice, harmonious with another study exhibited that they used the high-volume suction as a fundamental to control aerosols evacuation during clinical practice [30]. The participants in another previous study revealed that they are not anxious about the thought of being infected if the vaccine is available [31]. This corresponding to the answers of the participants in the current study, where the majority of the participants reported that they are not worried if a vaccine be available and they will take it. Moreover, when we asked them if COVID-19 medicine is available, would you be worried or hesitated to take it in case you needed it. The answers of most of them were positive.

Another Chinese study exhibited that there was a decline in dental treatments post-COVID-19 as compared to pre-COVID-19 [32]. Similarly, in the current study where all participants reported that there was a reduction in the numbers of patients post-COVID-19 and their clinical practice was for emergency cases.

There was fear among dentists in another study from transfer COVID-19 to their families, which is consistent with the participants' answers in the current study, where all participants reported that they were afraid to transfer COVID-19 to their families due to COVID-19 can continue a few hours to a few days on the surfaces, and they think that dental clinics can be a possible area of COVID-19 spread. Moreover, the participants in both studies clarified that they were fearful of getting quarantined due to COVID-19 [33].

There is increasing anxiety during the COVID-19 pandemic among all healthcare staff more than public people [34]. Similarly, in the current study where all participants revealed that, they feel fear or anxiety during the clinical practice due to COVID-19 and they postpone the treatment of COVID-19 patients.

In another study, almost 96.6% of the participants closed or reduced their clinical practice after 15 March 2020 and 86.7% of them reported that the patients were awareness the reasons. Where the participants said that 81.9% of patients asked for canceling the appointment after the COVID-19 pandemic [24]. Unlike what we found in the current study, where 28% of group I participants, 17% of group II participants and 30% of group III participants reported that the patients apologized to attend after 15 March 2020. In addition, 40% of group I participants, 20% of group II participants and 20 % of group III participants revealed that their patients were cooperative and aware of the cause of clinical practice closure and reduction in the college. This might be due to the lack of patients' awareness that is associated with insufficiency in their knowledge and commitment to the updated information about this new pandemic.

On the other hand, few percentages of participants in the current study show that there are oral symptoms and signs of COVID-19 such as xerostomia and reduction in taste due to the damaging effect of COVID-19 on tongue mucosa and salivary glands [35]. In another previous clinical study conducted on three COVID-19 patients, the participants revealed that there were recurrent oral ulcers and blisters in the oral mucosa of COVID-19 patients [36]. That is consistent with the answers of a few participants in the current study who reported that they detected some abnormal alterations in oral mucosa during the clinical practice after 15 March 2020.

The Impact of COVID-19 Prevalence and its Infection Control Measures on Clinical Practice and the Knowledge of Oral Mucosa Alterations of Some Dental Students of King Khalid University

13

To now, the effect of COVID-19 on oral tissues remain not clear and [37], so the participants in the current study revealed that the emergency dental treatment should not be delayed, regardless of COVID-19 status, but in some cases, they might be postponed if there is an opinion of a COVID-19 patient recovery within a few days after a laboratory test.

There were limitations of this study, such as cross-sectional design and the sample size, which cannot provide sufficient idea about the impact of COVID-19 prevalence and its infection control measures on clinical practice and the knowledge of oral mucosa alterations among all students in the college of dentistry, King Khalid University (males and females). However, this study may be the first step for increase awareness of dental students toward this global pandemic. This study might be an indicator of the need for policies that based on raising our students' knowledge during the clinical practice about the danger of COVID-19 infection. Moreover, this study will be a step for additional clinical and microbiological studies in the future.

Conclusion

We can conclude at the end of this study that the participants' knowledge and behavior toward COVID-19 and their awareness of the prevalence extent of COVID-19 in the surrounding community and during the clinical practice was sufficient. Furthermore, the participants' understanding of their role in COVID-19 prevention and infection control measures during their clinical practice was good. There was a negative impact of COVID-19 on the participants' clinical practice and oral mucosa alterations diagnosis knowledge. Finally, according to the results of the current study, we detected that the dental students in King Khalid University were anxious and afraid during the clinical practice due to the COVID-19 pandemic. Additionally, they reported that the priority of dental treatment was to the emergency cases and other dental procedures were postponed to avoid the spread of COVID-19.

Acknowledgements

Conflict of Interest

There is no conflict of interest.

Bibliography

1. Meng L., *et al*. "Coronavirus Disease 2019 (COVID-19): Emerging and Future Challenges for Dental and Oral Medicine". *Journal of Dental Research* 5.99 (2020): 481-487.

2. Riou J and Althaus CL. "Pattern of early human-to-human transmission of Wuhan 2019 novel coronavirus (2019-nCoV)". *Euro Surveillance* 25.5 (2020): 2000058.

3. Chan JF-W., *et al*. "A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster". *Lancet* 395 (2020): 514-523.

4. Novel CPERE. "The epidemiological characteristics of an outbreak of 2019 novel coronavirus diseases (COVID-19) in China". *Zhonghua Liu Xing Bing Xue ZaZhi* 41.2 (2020): 145.

5. Spagnuolo G., *et al*. "COVID-19 Outbreak: An Overview on Dentistry". *International Journal of Environmental Research and Public Health* 17.2094 (2020): 1-3.

The Impact of COVID-19 Prevalence and its Infection Control Measures on Clinical Practice and the Knowledge of Oral Mucosa Alterations of Some Dental Students of King Khalid University

14

6. Tang D., *et al*. "Prevention and control strategies for emergency, limited-term, and elective operations in pediatric surgery during the epidemic period of COVID-19". *World Journal of Pediatric Surgery* 3 (2020): e000122.

7. World Health Organization. "Laboratory testing for corona-virus disease 2019 (COVID-19) in suspected human cases: interim guidance, 2 March 2020" (2020).

8. Arab-News. "Saudi Arabia Announces First Case of Corona-virus". *Arab News* (2020).

9. Li R., *et al*. "Substantial undocumented infection facilitates the rapid dissemination of novel coronavirus (SARS-CoV2)". *Science* 368.6490 (2020): 489-493.

10. Li Q., *et al*. "Early transmission dynamics in Wuhan, China, of novel coronavirus infected pneumonia". *The New England Journal of Medicine* 382 (2020): 1199-1207.

11. Ibrahim NK., *et al*. "Cross-infection and infection control in dentistry: Knowledge, attitude and practice of patients attended dental clinics in King Abdulaziz University Hospital, Jeddah, Saudi Arabia". *Journal of Infection and Public Health* 10.4 (2017): 438-445.

12. Gaddey HL. "Oral manifestations of systemic disease". *General Dentistry* 65.6 (2017): 23-29.

13. Santosh ABR and Muddana K. "Viral infections of oral cavity". *Journal of Family Medicine and Primary Care* 9.1 (2020): 36.

14. Pedrosa M., *et al*. "Oral manifestations related to dengue fever: a systematic review of the literature". *Australian Dental Journal* 62.4 (2017): 404-411.

15. Chaux-Bodard A-G., *et al*. "Oral manifestation of Covid-19 as an inaugural symptom". *Journal of Oral Medicine and Oral Surgery* 26.2 (2020): 18.

16. Martín Carreras-Presas C., *et al*. "Oral vesiculobullous lesions associated with SARS-CoV-2 infection". *Oral Diseases* (2020): 1-3.

17. Backer JA., *et al*. "Incubation period of 2019 novel coronavirus (2019nCoV) infections among travellers from Wuhan, China, 20-28 January 2020". *Eurosurveillance* 25.5 (2020): 2000062.

18. Almutairi KM., *et al*. "Awareness, attitudes, and practices related to coronavirus pandemic among public in Saudi Arabia". *Family and Community Health* 38.4 (2015): 332-340.

19. CDC. "Centers for Disease Control and Prevention: Coronavirus (COVID-19) 2020". (2020).

20. Balkhy HH., *et al*. "Awareness, attitudes, and practices related to the swine influenza pandemic among the Saudi public". *BMC Infectious Diseases* 10 (2010): 42.

21. Guan W., *et al*. "Clinical characteristics of Corona-virus Disease 2019 in China". *The Journal of Emergency Medicine* 58.4 (2020): 711-712.

22. Goyal P., *et al*. "Clinical characteristics of Covid-19 in New York city". *The New England Journal of Medicine* 382.24 (2020): 2372-2374.

23. Zhou F., *et al*. "Clinical course and risk factorsfor mortality of adult inpatients with COVID-19 in Wuhan, China: a retro-spective cohort study". *Lancet* 395.10229 (2020): 1054-1062.

The Impact of COVID-19 Prevalence and its Infection Control Measures on Clinical Practice and the Knowledge of Oral Mucosa Alterations of Some Dental Students of King Khalid University

15

24. Consolo U., *et al.* "Epidemiological aspects and psychological reactions to COVID-19 of dental practitioners in the northern Italy districts of Modena and Reggio Emilia". *International Journal of Environmental Research and Public Health* 17 (2020): 3459.

25. Hanafy RMH. "Assessment of Practical and Emotional Consequences of Novel Coronavirus Emergence on Clinical Dental Practice in Egypt: A Cross Sectional Study". *Advanced Dental Journal* 3.1 (2021): 35-43.

26. Mizumoto K., *et al.* "Estimating the asymptomatic proportion of coronavirus disease 2019 (COVID-19) cases on boardthe Diamond Princess cruise ship, Yokohama, Japan, 2020". *Eurosurveillance* 25.10 (2020): 2000180.

27. MadaratiA., *et al.* "Dental-Dam for Infection Control and Patient Safety during Clinical Endodontic Treatment: Preferences of Dental Patients". *International Journal of Environmental Research and Public Health* 15 (2018): 2012.

28. Marui VC., *et al.* "Efficacy of preprocedural mouthrinses in the reduction of microorganisms in aerosol: A systematic review". *Journal of the American Dental Association* 150 (2019): 1015-1026.

29. Eggers M., *et al.* "In Vitro Bactericidal and Virucidal Efficacy of Povidone-Iodine Gargle/Mouthwash against Respiratory and Oral Tract Pathogens". *Journal of Infectious Diseases and Therapy* 7 (2018): 249-259.

30. Ge Z., *et al.* "Possible aerosol transmission of COVID-19 and special precautionsin dentistry". *Journal of Zhejiang University Science B* (2020): 1-8.

31. Lai J., *et al.* "Factors Associated with Mental Health Outcomes among Health Care Workers Exposed to Coronavirus Disease 2019". *JAMA Network Ope* 3 (2020): e203976.

32. Guo H., *et al.* "The impact of the COVID-19 epidemic on the utilization of emergency dental services". *The Journal of Dental Sciences* 15.4 (2020): 564-567.

33. Van Doremalen N., *et al.* "Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1". *The New England Journal of Medicine* 382.16 (2020): 1564-1567.

34. Ornell F., *et al.* "Pandemic fear and COVID-19: mental health burden and strategies". *Brazilian Journal of Psychiatry* 42 (2020): 232-235.

35. Xu H., *et al.* "High expression of ACE2 receptor of 2019-nCoV on the epithelial cells of oral mucosa". *International Journal of Oral Science* 12 (2020): 8.

36. Martín Carreras-Presas C., *et al.* "Oral vesiculobullous lesions associated with SARS-CoV-2 infection". *Oral Diseases* 27.3 (2021): 710-712.

37. Dziedzic A and Wojtyczka R. "The impact of coronavirus infectious disease 19 (COVID-19) on oral health". *Oral Diseases* (2020): 1-4.